

CLAIMS

What is claimed is:

1. A method performed in an access node of a wave division multiplexing optical network, the method comprising:
receiving a demand for allocating a first protection path that meets a first set of disjointness constraints with respect to a first working path according to a first protection scheme having a first priority;
in response to the demand, locating a second protection path that meets a second set of disjointness constraints with respect to a second working path according to a second protection scheme having a second priority; and
assigning the second protection path as a protection path to the first working path if the first priority of the first protection scheme is higher than the second priority of the second protection scheme.
2. The method of claim 1, further comprising allocating another path as a protection path for the second working path if the second protection path is assigned to the first working path.
3. The method of claim 1, wherein the priorities of the first and second protection schemes are determined based on a predetermined protection scheme priority order.
4. The method of claim 3, wherein the predetermined protection scheme priority order is specified by an owner of the optical network.

5. The method of claim 3, wherein the predetermined protection scheme priority order comprise an order from high to low priorities as of 1+1, 1:1, 1:N, and reroutable.
6. The method of claim 3, wherein the second protection path is searched and located according to the predetermined protection scheme priority order from low to high priorities.
7. The method of claim 3, wherein the second protection path is searched and located further according to a predetermined disjointness order having a plurality of disjointness preferences from most preferred disjointness to least preferred disjointness.
8. The method of claim 7, wherein the predetermined disjointness order is specified by an owner of the network.
9. The method of claim 7, wherein the predetermined disjointness order comprises an order from the most preferred to the least preferred as of fully node disjointness, fully link disjointness, maximally node disjointness, and maximally link disjointness.
10. The method of claim 7, wherein the second protection path is searched and located according to the predetermined disjointness order from the most preferred disjointness to the least preferred disjointness with respect to the first working path.
11. An apparatus, comprising:
an access node, to be coupled in a wavelength division multiplexing optical network,
including,

a database to store a representation of available paths from the access node to reachable destinations, the available paths including one or more working paths protected by one or more protection paths, and

a routing module to

receive a demand for a first protection path that meets a set of

disjointness constraints with respect to a first working path

according to a first protection scheme having a first priority,

in response to the demand, locate from the database a second protection

path that meets a second set of disjointness constraints with

respect to a second working path according to a second

protection scheme having a second priority, and

assign the second protection path as a protection path to the first

working path if the first priority of the first protection scheme is

higher than the second priority of the second protection scheme.

12. The apparatus of claim 11, wherein the routing module allocates another path as a protection path for the second working path if the second protection path is assigned to the first working path.
13. The apparatus of claim 11, wherein the priorities of the first and second protection schemes are determined based on a predetermined protection scheme priority order.
14. The apparatus of claim 13, wherein the predetermined protection scheme priority order is specified by an owner of the optical network.

15. The apparatus of claim 13, wherein the predetermined protection scheme priority order comprise an order from high to low priorities as of 1+1, 1:1, 1:N, and reroutable.
16. The apparatus of claim 13, wherein the second protection path is searched and located according to the predetermined protection scheme priority order from low to high priorities.
17. The apparatus of claim 13, wherein the second protection path is searched and located further according to a predetermined disjointness order having a plurality of disjointness preferences from most preferred disjointness to least preferred disjointness.
18. The apparatus of claim 17, wherein the predetermined disjointness order is specified by an owner of the network.
19. The apparatus of claim 17, wherein the predetermined disjointness order comprises an order from the most preferred to the least preferred as of fully node disjointness, fully link disjointness, maximally node disjointness, and maximally link disjointness.
20. The apparatus of claim 17, wherein the second protection path is searched and located according to the predetermined disjointness order from the most preferred disjointness to the least preferred disjointness with respect to the first working path.
21. A method performed in an access node of a wave division multiplexing optical network, the method comprising:

searching, in response to a demand for a protection path that meets a first set of disjointness constraints with respect to a working path, in a database a first protection path that meets the first set of disjointness constraints; and if the first protection path cannot be located, searching a second protection that meets a second set of disjointness constraints, the second set of disjointness constraints being determined according to a disjointness preference order specified by an owner of the network.

22. The method of claim 21, wherein the disjointness preference order comprises an order from the most preferred to the least preferred as of fully node disjointness, fully link disjointness, maximally node disjointness, and maximally link disjointness.
23. The method of claim 22, wherein the second protection path is searched from the most preferred disjointness to the least preferred disjointness with respect to the working path.
24. An apparatus, comprising:
 - an access node, to be coupled in a wavelength division multiplexing optical network, including,
 - a database to store a representation of available paths from the access node to reachable destinations, the available paths including one or more working paths protected by one or more protection paths, and
 - a routing module to
 - search, in response to a demand for a protection path that meets a first set of disjointness constraints with respect to a working path, in a database a first protection path that meets the first set of disjointness constraints, and

if the first protection path cannot be located, search a second protection path that meets a second set of disjointness constraints, the second set of disjointness constraints being determined according to a disjointness preference order specified by an owner of the network.

25. The apparatus of claim 24, wherein the disjointness preference order comprises an order from the most preferred to the least preferred as of fully node disjointness, fully link disjointness, maximally node disjointness, and maximally link disjointness.
26. The apparatus of claim 25, wherein the second protection path is searched from the most preferred disjointness to the least preferred disjointness with respect to the working path.
27. A method performed in an access node of a wave division multiplexing optical network, the method comprising:
 - receiving a demand for a first protection path associated with a first working path according to a first protection scheme having a first priority, and
 - preempting a second protection path associated with a second working path according to a second protection scheme having a second priority, if the first priority is higher than a second priority according to a protection scheme priority order specified by an owner of the network.
28. The method of claim 27, wherein the protection scheme priority order comprise an order from high to low priorities as of 1+1, 1:1, 1:N, and reroutable.

29. The method of claim 27, wherein the second protection path is searched and located according to the protection scheme priority order from low to high priorities.
30. An apparatus, comprising:
an access node, to be coupled in a wavelength division multiplexing optical network,
including,
a database to store a representation of available paths from the access node to reachable destinations, the available paths including one or more working paths protected by one or more protection paths, and
a routing module to
receive a demand for a first protection path associated with a first working path according to a first protection scheme having a first priority, and
preempt a second protection path associated with a second working path according to a second protection scheme having a second priority, if the first priority is higher than a second priority according to a protection scheme priority order specified by an owner of the network.
31. The apparatus of claim 30, wherein the protection scheme priority order comprise an order from high to low priorities as of 1+1, 1:1, 1:N, and reroutable.
32. The apparatus of claim 30, wherein the second protection path is searched and located according to the protection scheme priority order from low to high priorities.